

NS3 Baseline Simulation

METRIC MEASUREMENT RESULTS

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CSE 322

The Topology

Wired-Wireless Dumbbell with variable no. of sender-receiver pairs(S/R)

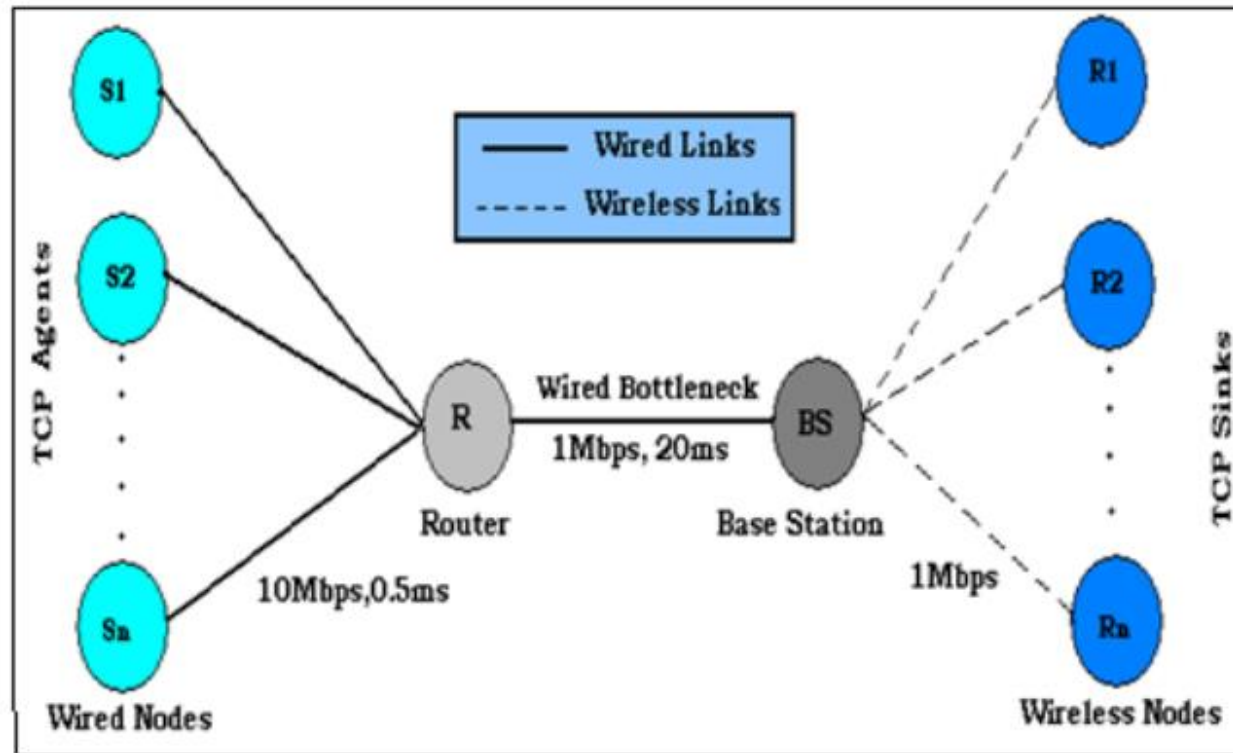


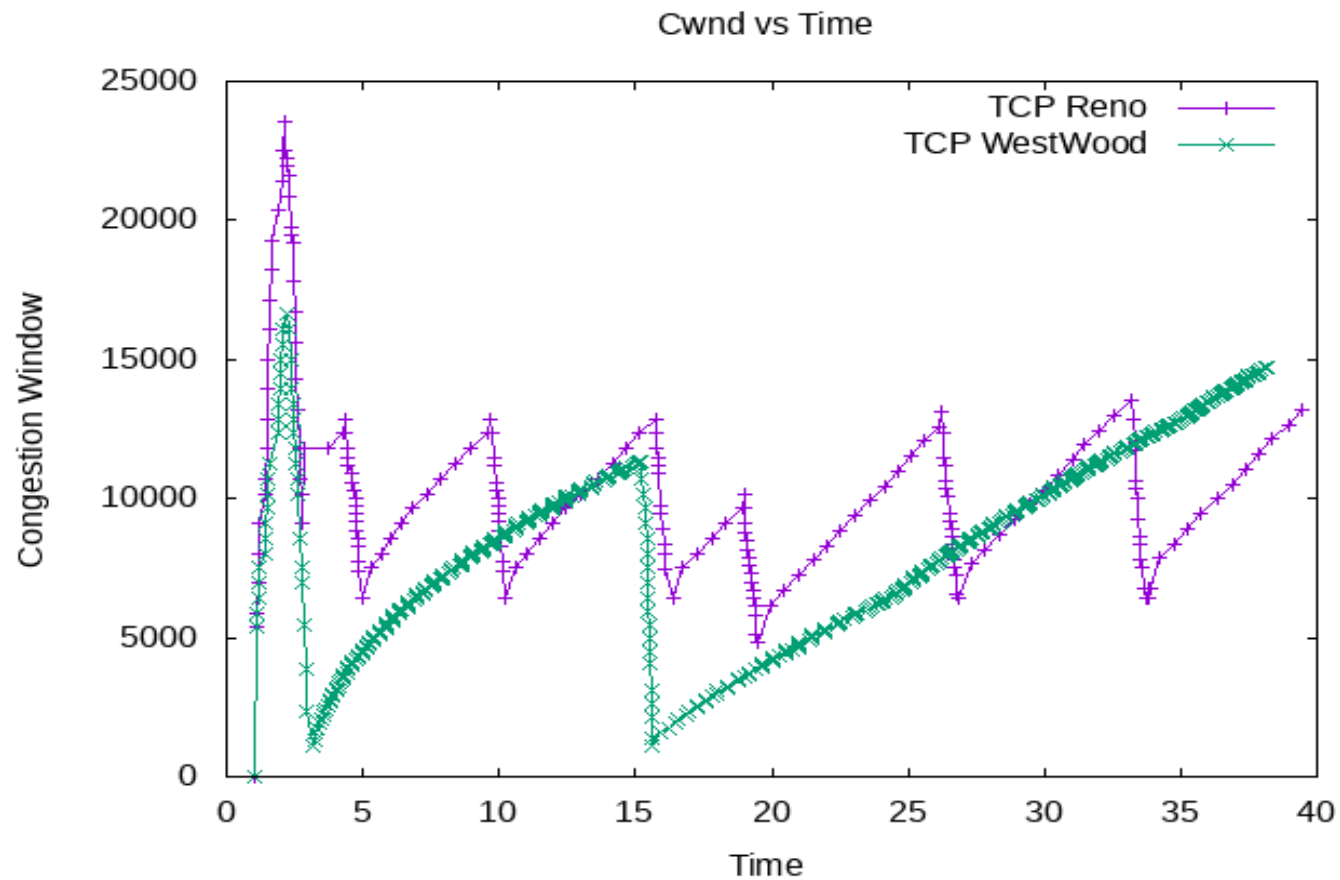
Figure 1: Network Scenario used for simulation

Each flow is from i th sender to i th receiver. So if there are n S/R pairs, there would be $2n$ flows [R also sends ACK to S]

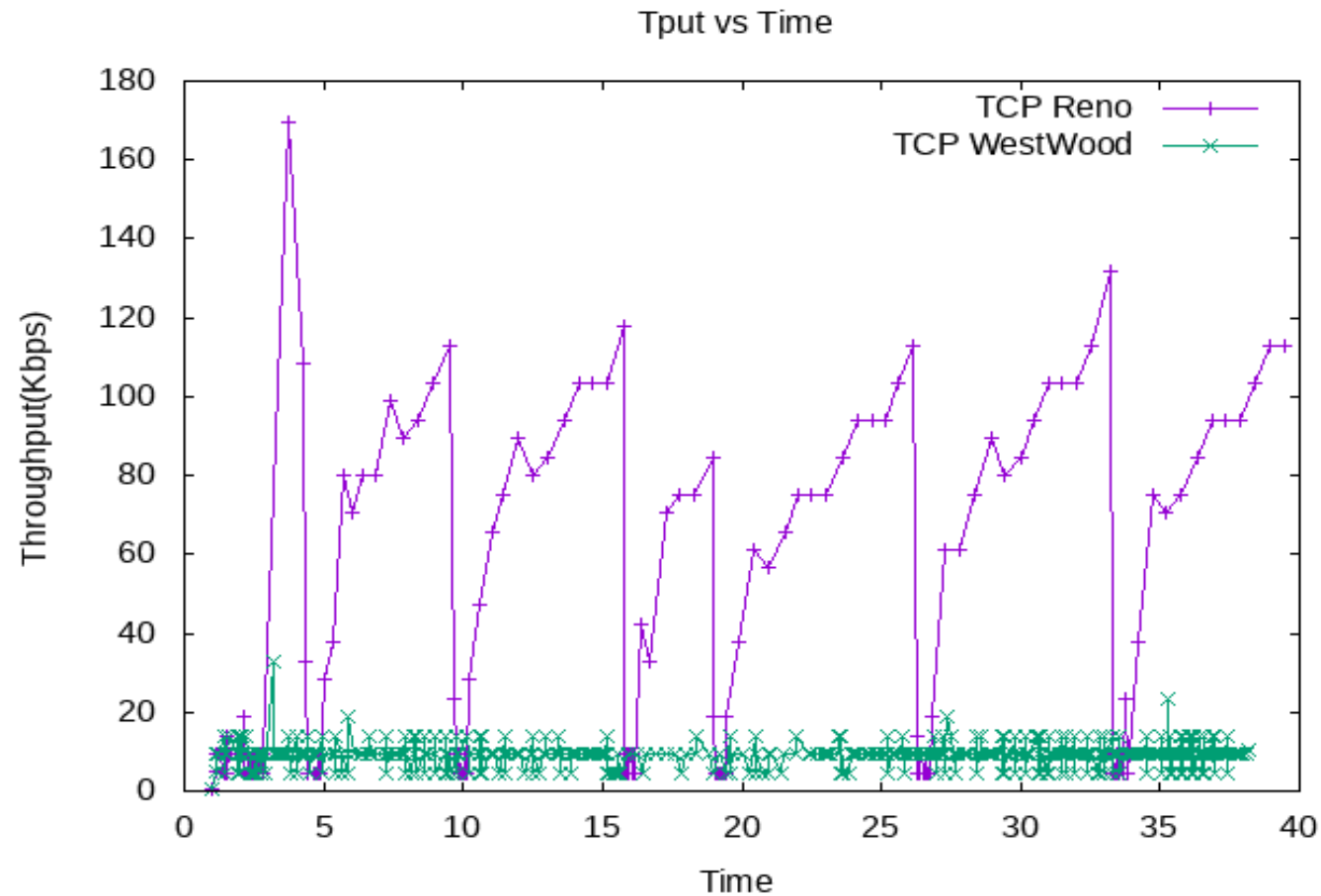
Parameters

```
230 // NO OF NODES ON EACH SIDE OF DUMBBELL
231 uint32_t nWifi = 6;
232
233 //=====GLOBAL VARS=====
234 uint port = 9000;
235 uint numPackets = 40000;
236 uint packetSize = 1024; //Bytes
237 std::string transferSpeed = "10Mbps"; // App dataRate
238
239 //Simulation Times
240 double sinkStart = 0;
241 double appStart = 1;
242 double stopTime = 50;
243 double ErrorRate = 0.0005;
244 //=====
```

Changes in CWND



Instantaneous Throughput



TCP Reno Statistics

Per Node Statistics:

Sender: Bottom Left Wired Node, Sink: Bottom Right Wireless Node

S/R Pair	Throughput (Kbps)	End-to-End Delay (ns)	Packet Delivery Ratio	Packet Drop Ratio	Jitter (ns)
1	965.506	+2.71369e+12	99%	0%	+3.42513e+10
2	937.127	+2.64255e+12	99%	0%	+3.43685e+10
3	271.478	+9.16214e+11	98%	1%	+1.41345e+10
4	255.226	+9.52686e+11	97%	2%	+1.83092e+10
5	210.008	+8.32678e+11	98%	1%	+1.98625e+10
6	159.989	+6.68609e+11	97%	2%	+1.89191e+10

TCP Reno Statistics

Full Network Mean Statistics:

S/R Pair	Average Throughput (Kbps)	Average End-to-End Delay (ns)	Average Packet Delivery Ratio	Average Packet Drop Ratio	Average Jitter (ns)
1	506.663	+2.73133e+12	99%	0%	+3.42764e+10
2	328.275	+2.6597e+12	99%	0%	+3.43811e+10
3	172.623	+3.29087e+12	99%	0%	+4.93307e+10
4	129.26	+3.66621e+12	98%	1%	+7.10827e+10
5	102.944	+3.95959e+12	98%	1%	+9.51005e+10
6	85.8948	+4.09785e+12	98%	1%	+1.12157e+11

TCP Westwood Statistics

Per Node Statistics:

Sender: Bottom Left Wired Node, Sink: Bottom Right Wireless Node

S/R Pair	Throughput (Kbps)	End-to-End Delay (ns)	Packet Delivery Ratio	Packet Drop Ratio	Jitter (ns)
1	972.394	+1.80546e+12	99%	0%	+3.48143e+10
2	944.026	+1.90967e+12	99%	0%	+3.4305e+10
3	277.752	+6.99751e+11	99%	0%	+1.26454e+10
4	240.069	+6.58731e+11	99%	0%	+1.25168e+10
5	240.487	+7.72101e+11	99%	0%	+1.44243e+10
6	161.26	+5.13805e+11	99%	0%	+1.00362e+10

TCP Westwood Statistics

Full Network Mean Statistics:

S/R Pair	Average Throughput (Kbps)	Average End-to-End Delay (ns)	Average Packet Delivery Ratio	Average Packet Drop Ratio	Average Jitter (ns)
1	508.642	+1.82244e+12	99%	0%	+3.48396e+10
2	329.686	+1.92617e+12	99%	0%	+3.43268e+10
3	171.578	+2.73508e+12	99%	0%	+4.41908e+10
4	128.554	+2.64199e+12	99%	0%	+4.96624e+10
5	103.718	+3.02155e+12	99%	0%	+5.92611e+10
6	87.8714	+3.20468e+12	99%	0%	+6.41199e+10

Throughput vs S/R Pairs

